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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

STREGE, JOHN B

ART UNIT

PAPER NUMBER

2625

DATE MAILED: 06/04/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/876,795

Applicant(s)

HOON ET AL.

Examiner

John B Strege

Art Unit

2625

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 June 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 June 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-4, and 6-8 are rejected under 35 U.S.C. 102(b) as being anticipated by Suzuki USPN 5,995,220.

Claim 1 discloses, "a system for multiple image analysis comprising: a first light source; a second light source; a camera; and a multiple image processor coupled to the first light source, the second light source, and the camera, the multiple image processor causing the first light source and the second light source to turn on and the camera to generate two or more sets of image data."

In figure 1 Suzuki discloses a semiconductor package inspection apparatus 20, that includes multiple lighting sources 2-4 that each project light of a different wavelength (col. 3 lines 17-23), and a camera 5. The inspection apparatus 20 is coupled to the light sources and the camera, and controls the lightings 2-4, thus causing them to turn on (col. 3 lines 50-54). Furthermore it performs multiple image processing using the images generated by camera 5 (col. 3 lines 50-54).

Regarding claim 2, since the wavelength of each of the sources is different (col. 3 lines 17-23) this means that the frequency the light sources emit are also different.

Regarding claim 3, the camera 5 is made up of three CCD cameras 8-10 and each one generates an image when the three light sources are emitting light (col. 3 lines 24-41).

Regarding claim 4, the CCD cameras 8-10 comprise pixels receiving the light, thus these cameras can be read as different sets of pixels receiving light at different frequencies.

Regarding claim 6, the inspection apparatus 20 controls the lighting of the three sources 2-4, thus causing them to turn on and off.

Regarding claim 7, the inspection apparatus 20 processes multiple images to detect missing, blurred or mislocated parts, or other defects (col. 4 lines 16-25) thus the defects generating image data that indicates whether the semiconductor is acceptable.

Regarding claim 8, Suzuki discloses that the photographic processes needed for lead inspection, mask inspection and package defect inspection which is carried out using the obtained images may be conducted simultaneously, thus reducing the photographing time and affording efficient semiconductor inspection (col. 4 lines 38-42). Thus providing for different image analyzers receiving the image data and generating status data that indicates whether the image data is acceptable.

3. Claims 11, 12, and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by Yoshimura et al. USPN 5,946,029 (hereinafter "Yoshimura").

Claim 11 discloses, "a method for inspecting a component comprising:
illuminating the component from a first illumination angle; receiving first image data of

the component; illuminating the component from a second illumination angle; receiving second image data of the component; and using the first image data and the second image data to determine whether a dimension of the component is acceptable.”

Yoshimura discloses an image processing method to realize measurements of the three-dimensional configuration of an object as well as defects on the object (col. 1 lines 4-10). As seen in figure 2, a camera is used to receive first image data from an illumination source L1 at a first angle. The light source is then moved to a second position L2 thus changing the illumination angle and second image data is received (col. 5 lines 24-33). From this image information the three-dimensional configuration of the object can be obtained (col. 6 lines 11-12) and flaws on the object can be detected (col. 7 lines 66 – col. 8 line 2).

Regarding claim 12, Yoshimura discloses in figure 18 illuminating using a red light source 2R, a green light source 2G, and a blue light source 2B which are all placed at different positions thus creating different illumination angles. Since the lights are different colors they emit light at different frequencies.

Regarding claim 15, a camera 1 is used to obtain the images, and a camera consists of a set of pixels for receiving image data.

4. Claim 17 is rejected under 35 U.S.C. 102(b) as being anticipated by Tsai et al. USPN 5,822,055 (hereinafter “Tsai”).

Claim 17 discloses, “a method for inspecting a component comprising: receiving first image data and second image data of the component; comparing the first image

data to reference image data to generate first difference data; comparing the second image data to reference image data to generate second difference data; and generating component dimension data from the first difference data and the second difference data.”

Tsai discloses a method for the optical inspection of specimens (col. 1 lines 10-11) where a wafer 14 is illuminated by the appropriate brightfield or darkfield illumination. A sensor 16 captures the image for each illumination and the images generated for each illumination are compared respectively to a reference wafer image. These difference signals are used for sizing and locating the defects (col. 4 line 57 – col. 5 line 5, and col. 3 lines 32-57).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki USPN 5,995,220 in view of Lehnen et al. USPN 5,982,493 (hereinafter “Lehnen”).

Claim 5 discloses, “the system of claim 2 wherein the camera further comprises: a first filter passing light at the first frequency; and a second filter passing light at the second frequency.”

As discussed above Suzuki discloses all of the limitations of claim 2. Suzuki does not explicitly disclose a first filter passing light at a first frequency, and a second filter passing light at the second frequency. Suzuki uses one or more multi layer film prisms 7 that utilize the basic principle of a multi-layer film interference filter in order to pass light at the different frequencies.

Lehnen discloses a method for acquiring multiple images of an object that uses dichroic filters (54,56,58) to separate lights of different frequencies (as stated at least in the abstract).

Suzuki and Lehnen are analogous art because they are from the same field of endeavor of inspecting semiconductors by detecting multiple illuminations of different frequencies.

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine Suzuki, and Lehnen in order to use dichroic filters to separate the light entering the camera 5 instead of prisms. The motivation for doing so is that it would be an effective tool for separating the light and would be less expensive than a prism. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Suzuki and Lehnen to obtain the invention as specified in claim 5.

7. Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki USPN 5,995,220 in view of Tsai et al. USPN 5,822,055.

Claims 9 disclose an image comparator receiving the two or more sets of image data and generating difference data. Claim 10 discloses an image constructor receiving the two or more sets of image data and generating dimensional variation data.

Suzuki discloses all of the limitations of claim 1 and discloses carrying out different types of inspection from the images, but fails to disclose how the images are used to carry out the inspection.

Tsai discloses optically inspecting a specimen for defects that receives different images and develops difference signals for those images from a reference image (col. 3 lines 31-58) and from the signals allows for sizing and locating the defects which are a variation from the typical surface (col. 5 lines 1-5).

Suzuki and Tsai are analogous art because they are from the same field of endeavor of inspecting object surfaces.

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine Suzuki and Tsai in order to obtain defect detection from the images using difference data, and generating dimensional variation data. The motivation for doing so would be that difference data provides an effective method for detecting defects when the images are obtained. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Suzuki and Tsai to obtain the invention as specified in claims 9-10.

8. Claims 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshimura et al. USPN 5,946,029 in view of Lehnert et al. USPN 5,982,493.

Yoshimara discloses all of the limitations of claim 11 but does not explicitly disclose receiving the light through a filter.

Lehnen discloses separating the light sources using dichroic filters (54, 56, 58) to obtain separate images for each of the different frequency light sources. Lehnen states that a problem with illuminating the device with one light beam at a time and forming images is that the device must be stationary the whole time which is time consuming (col. 1 lines 16-30). By using different colored lights and filters multiple images can be formed at once the invention is more time efficient and less expensive.

Yoshimara and Lehnen are analogous art because they are from the same field of endeavor of detecting signals obtained from various different frequency light sources in order to inspect an object.

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine Yoshimara and Lehnen in order to obtain image data through a filter to separate the light. The motivation for doing so is that it would make the inspection system more time efficient. Therefore it would have been obvious to one of ordinary skill in the art to combine Yoshimara and Lehnen to obtain the invention as specified in claim 13.

Regarding claim 14, Lehnen discloses multiple filters for the different frequencies.

9. Claim 16 rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshimura et al. USPN 5,946,029 in view of Suzuki USPN 5,995,220.

Claim 16 discloses receiving the first image data with a first set of pixels and the second set of data with a second set of pixels.

Yoshimura does not explicitly disclose receiving the first image data with a first set of pixels and the second set of data with a second set of pixels.

Suzuki discloses a camera 5 (figure 1) that separates the light entering it to multiple CCD's (pixel sets) in order to obtain multiple images of the object from different light frequencies (as stated in the abstract).

Yoshimura and Suzuki are analogous art because they are from the same field of endeavor of object inspection using multiple light sources of different frequencies.

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine Yoshimura and Suzuki to obtain images with different sets of pixels. The motivation for doing so is that it allows for multiple images to be created for each different frequency light thus providing faster processing times. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Yoshimura and Suzuki to obtain the invention as specified in claim 16.

10. Claims 18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai et al. USPN 5,822,05 in view of Stern et al. USPN 6,075,883 (hereinafter "Stern").

Claim 18 discloses combining the first image data and the second image data to generate composite image data, comparing the composite reference data to generate

Art Unit: 2625

composite difference data and generating component dimension data from the composite difference data.

Tsai discloses all the limitations of claim 17. Tsai does not explicitly disclose generating composite image data, however as discussed discloses comparing the image data to reference data to obtain dimension data.

Stern discloses a method for imaging an object or pattern using two light sources involving bright-field and dark-field images (col. 4 lines 52-61). From the multiple images that are obtained a composite image is formed (as seen in fig. 7A, step 740).

Tsai and Stern are analogous art because they are from the same field of endeavor of optical inspection using bright and dark field images.

At the time of the invention it would have been obvious to one of ordinary skill in the art to combine Tsai and Stern to obtain composite images and use them to carry out the inspection. The motivation for doing so would be to obtain the best image possible in order to do the comparison with the reference data. Therefore it would have been obvious to one of ordinary skill in the art to combine Tsai and Stern to obtain the invention as specified in claim 18.

Regarding claim 20, as seen in figure 1A the images are obtained using light source angular data.

11. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai et al. USPN 5,822,055.

Claim 19 discloses "the method of claim 17 wherein the step of receiving the first image data and the second image data of the component is preceded by the step of receiving status data that indicates that the component requires additional analysis to determine whether it has unacceptable dimensional variations."

Tsai does not explicitly disclose receiving status data that indicates that the component requires additional analysis to determine whether it has unacceptable dimensional variations. As it is well known in the art of inspection to receive status data based on an image processing procedure that indicates that the component requires additional analysis to determine if it is unacceptable the Examiner declares official notice.

It would be obvious to one of ordinary skill in the art to receive status data that indicates that the component requires additional analysis. The motivation for doing so would be to separate the major errors in a device which would affect the functionality from the minor errors that would not affect the functionality of the device. Therefore it would have been obvious to modify Tsai accordingly to obtain the invention as specified in claim 19.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John B Strege whose telephone number is (703) 305-8679. The examiner can normally be reached on Monday-Friday between the hours of 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on (703) 308-5246. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JS



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